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FACTS

FOR ENVIRONMENTAL STUDIES

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Ministry
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about pollution...

SET 2

AIR POLLUTION - PARTICULATES

CONSTRUCTING A CLASSROOM ECOSYSTEM:

A VISIT TO A LANDFILL SITE

AN ANTI-POLLUTION CLUB

STUDY PROJECT

CAFETERIA CRISIS

THE PRESENT TENSE OF SOAP



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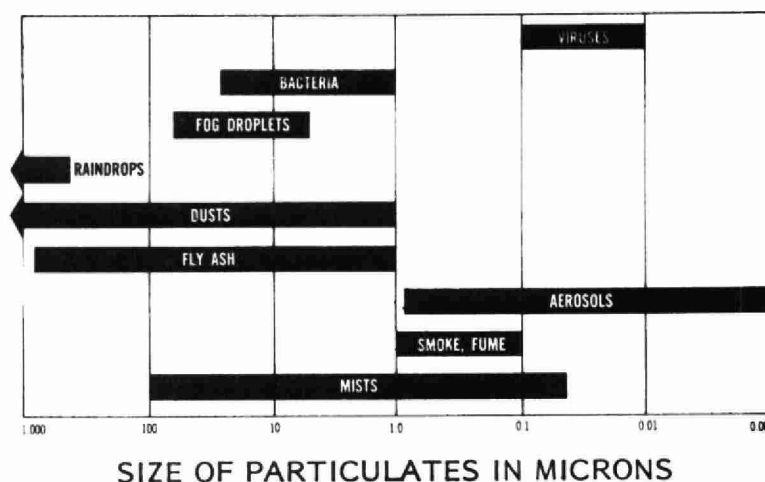
AN ACTIVITY TO STUDY AIR POLLUTION - PARTICULATES: AN EDUCATIONAL FACT SHEET

(This fact sheet was prepared to assist students interested
in carrying out environmental studies.)

I Introduction*

When a liquid or solid substance is emitted to the air as particulate matter, its properties and its effects may be changed. Secondary particulates - those created in the atmosphere by the reaction of gases to each other - may also have very different properties from the original substances. And secondary particulates are of great importance.

THE SIZE AND TYPES
OF PARTICULATE
MATTER FOUND IN
THE AIR WE BREATHE



Whether primary or secondary, atmospheric particulates have some significant characteristics.

Very small aerosols (particulates from 0.001 to 0.1 microns in diameter) can act as nuclei on which vapor condenses relatively easily. Fogs, ground mists, and rain may be thus increased and prolonged.

Particulates less than two or three microns in size - about half (by weight) of the particles suspended in urban air are estimated to be that small - can reach deep into the part of the lung that is unprotected by mucus, and can attract and carry such harmful chemicals as sulfur dioxide with them. Sulfur dioxide alone would be dissolved on the mucus before it reached the vulnerable tissue.

* reproduced with permission of the American Lung Association

Particulates can act as catalysts. (Catalysis is the process in which the chemical change of a compound is brought about or sped up by an outside substance that remains unchanged itself. The unchanged substance is known as the catalyst.) An example of this characteristic is the change of sulfur dioxide to sulfuric acid, helped by catalytic iron oxides.

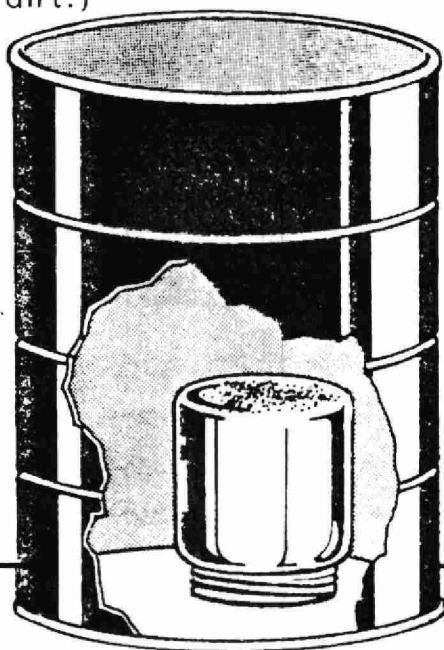
Aerosols can absorb radiant energy and conduct heat quickly to the surrounding gases of the atmosphere - gases that are incapable of absorbing radiant energy by themselves. As a result, the air in contact with the aerosols becomes much warmer. Some scientists now fear that the increasing aerosol emissions of jet planes high in the troposphere may eventually form a heat-absorbing veil that will lessen the penetration of the sun's rays to the earth.

Particulates, it appears, do a lot more than soil our clothes.

II Materials Needed:

- vaseline petroleum jelly;
- baby food jars, or other small clean containers like clear plastic cups;
- soup, coffee, or other medium sized cans.

(The small jar, heavily coated with vaseline, collects a good sampling of particles carried in the air. These particles are called "particulate" air pollution. The larger can prevents the inverted jar from collecting ground dirt.)



III Placement of Collector Jars

There are a number of ways of carrying out a particulate survey but basically you must find sites where your collectors will not be disturbed by curious people for up to a week.

You might wish to investigate your own neighborhood or school area. It is of value to draw up a map of whatever area you choose. If you draw the map at the top of a page then the bottom half of the page can be used to record notes.

Select the sites for your pollution collectors carefully. Be sure to include areas you feel will be relatively free of pollution. (Set up one or two 'controls', collectors that have a lid over them. You can compare the control jars to the other jars at the end of the experiment.)

If rain is suspected on a given day, part way through the experiment, it might be wise to either cover the collectors carefully until the rain is over, or to stop the experiment at that time and see if any results have developed.

Some collectors might be placed in garages, or at the corners of buildings, or in open fields where it is windy, or near construction sites, or along the edge of dusty roads or where there is heavy traffic (but take care to avoid dangerous roads or sites).

After the collectors have been mapped, it would be advisable to also map potential sources of particulate pollution such as;

- i) trash barrels, used for burning waste;
- ii) smoke stacks and chimneys;
- iii) incinerators;
- iv) outdoor barbeques and fireplaces;
- v) automobiles;
- vi) power lawn mowers.

IV After a week

When one week has passed, collect all the vaseline coated jars, labeling each with masking tape to match the map.

Use a hand magnifying lens to look at the particles collected on the bottles. Attempt to arrange the bottles from the dirtiest to cleanest and to record your results on a separate piece of paper. Attempt to explain why you think each bottle was as dirty or as clean as it ended up. You might attempt to describe the type of particulate matter on each bottle such as;

- i) dust, blackish dirt, ashes - large particles;
- ii) dust, small insect, brownish dirt particles;
- iii) sand, small gravel, dirt;
- iv) very black dust;
- v) dust, one small leaf, black specks of ash.



V Some Questions to Consider

1. What was the possible origin for each of the types of particulates found in your collectors?
2. What types of particulates are natural air pollutants, the result of wind action and not dependent on man's actions?
3. Can you think of a way of attaching a different kind of collector to a car or other mobile vehicle to get samples when the sampler is moving. (Hint: heavy waxed paper, vaseline, scissors, and tape are required.)
4. Using the test material devised in 3, can you figure out a way to test how many particulates hit various parts of a car as it is moving.

(This activity and set of questions were adopted with permission from the publication DIRTY AIR, prepared by the Minnesota Environmental Sciences Foundation Inc.)

VII Glossary of Terms (taken with permission from AIR POLLUTION PRIMER by the American Lung Association)

Aerosols:	Solid or liquid particles, smaller than 0.1 microns in diameter, suspended in a gas.
Air Pollution:	Man-made contamination of the atmosphere, beyond that which is natural.
Dust:	Any solid particulate matter over 1 micron in size.
Environment:	The aggregate of all the external conditions and influences affecting the life, development, and ultimately the survival of an organism.
Fly Ash:	The particulate impurities resulting from the burning of coal and other material, which are exhausted into the air from stacks.
Incineration:	The burning of household or industrial waste.
Micron:	A unit measurement equal to 1/1,000,000 of a meter.
Particulate:	A particle of solid or liquid matter.
Smoke:	Solid or liquid particles under 1 micron in diameter.
Soot:	Very finely divided carbon particles clustered together in long chains.

VIII Recommended Readings

1. Air Pollution Primer, by American Lung Association, 1969. An excellent account of the various aspects of air pollution written in the layman's language.
2. Dirty Air, by Minnesota Environmental Sciences Foundation, Inc., 5400 Glenwood Avenue, Minneapolis, Minnesota, 1974. This 16 page publication outlines five studies concerning air pollution including the one outlined in this fact sheet.
3. "The Air We Breathe", Pollution Probe, by D.A. Chant, New Press, 1970.
4. "Air Pollution", Environmental Pollution, by Andrews et al., 1972.
5. The Air Around Us, by T.J. Chandler, Doubleday, 1966.

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CONSTRUCTING A CLASSROOM ECOSYSTEM: AN EDUCATIONAL FACT SHEET

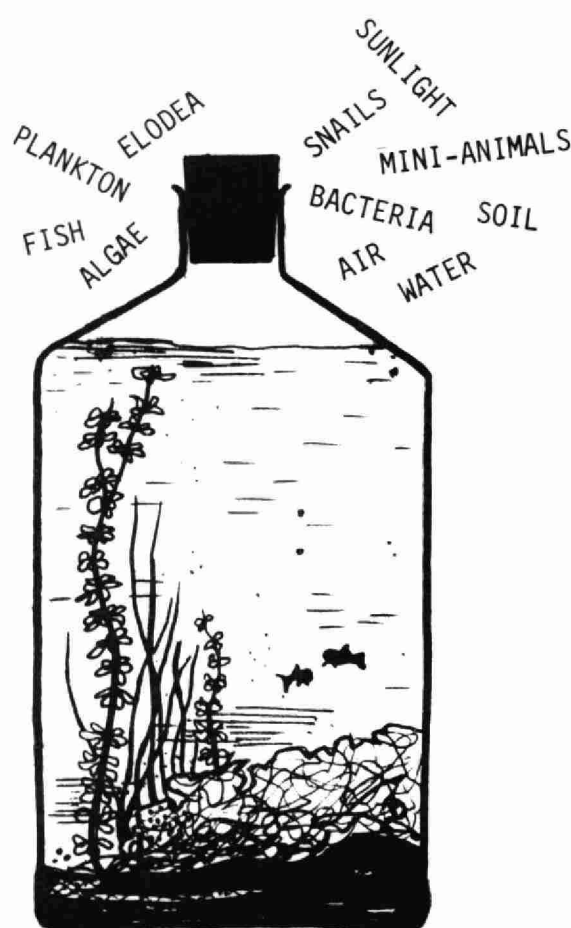
I INTRODUCTION

Construction and observation of a classroom ecosystem can help the average elementary or secondary student develop many basic ecological concepts. What are the basic requirements of living things? Why is sunlight so important? How is oxygen produced? These are some of the questions a classroom ecosystem can generate.

We, on earth, depend upon the continued reuse of air, water, and land much the same as astronauts are required to reuse the limited resources they take along on space journeys. Apart from the sun's rays that supply life-giving energy for plant growth, nothing else has to enter or leave the earth's biosphere to sustain life. For this reason the earth has been likened to a spaceship, and our planet has been referred to as spaceship earth. If life aboard our spaceship is to continue in a desirable fashion, we must pay more attention to the workings of the environment and the ecosystem in which we live.

But, ours is a complex system, mind-boggling in its total complexity. The classroom ecosystem can provide a simplification of ecological processes for the purpose of initiating thoughts and discussions of greater importance and magnitude.

If we fail to grasp enough knowledge about the workings of our world - our ecosystem - problems await us. The price we pay may be great. Some have even said that pollution of our vital resources could threaten the very existence of many of the passengers on board spaceship earth.

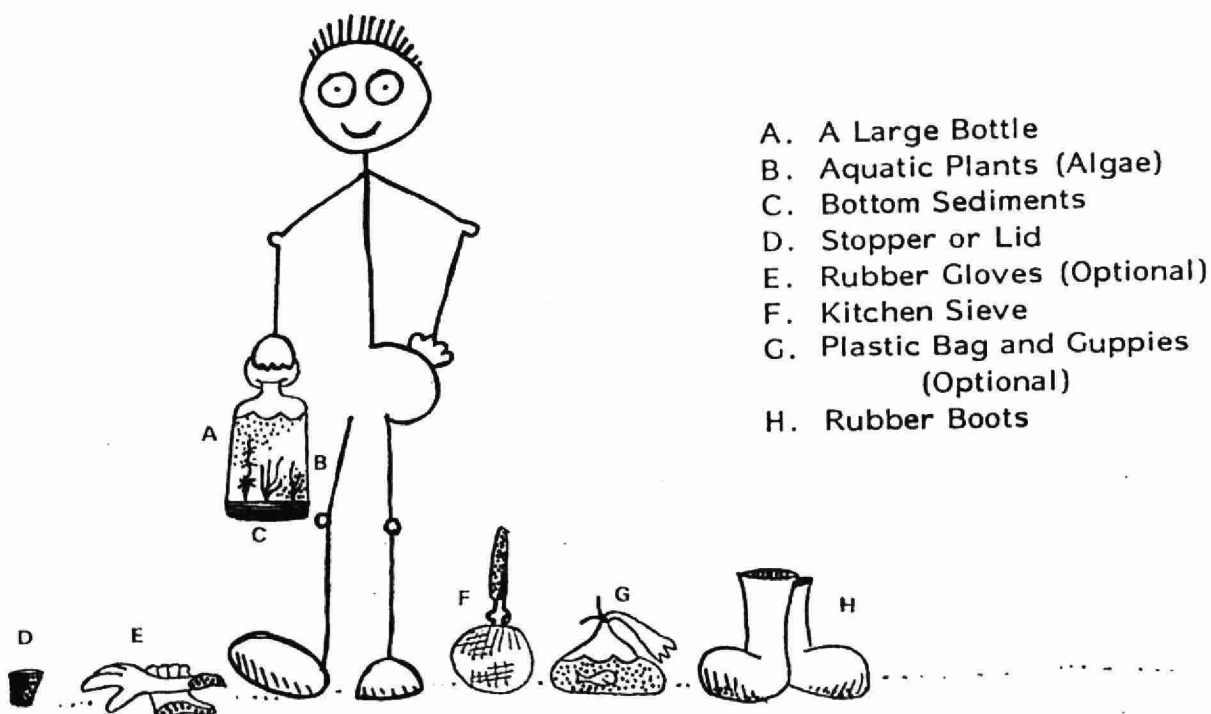


II THE ECOSYSTEM CONCEPT

Ecology can be simply defined as the study of the relationships of living things to each other and their physical environment. In any given community there is always tremendous interaction between the living (biotic) and non-living (abiotic) components. The cyclic transfers between populations of plants and animals in a community and their non-living environment are implied in the term ecosystem.

What is an ecosystem? Why study one? Especially why study a miniature one in a bottle?

By building a miniature classroom ecosystem one can actually witness the intricate workings of an interacting community relying only on the input of light energy for maintenance. The complexity of this system and the cyclical pattern of life will become apparent over a prolonged period of time. And, the beauty of it all is that once set up, no further work is required, just close observation.



III CONSTRUCTION OF AN ECOSYSTEM

- 1) Obtain as large a bottle as possible (preferably one with a lid, or one that can be stoppered).
- 2) Clean the bottle thoroughly.

- 3) Visit either a slow-flowing stream or, preferably, a pond or lake shore. A site where aquatic plants are growing will probably yield a variety of aquatic life, both plant and animal.
- 4) Scoop approximately two to three inches of bottom sediment into the bottle. If there are aquatic plants (especially algae) at the site, obtain a portion of these. (A kitchen sieve will act as a net to catch tiny aquatic organisms that might live amongst the aquatic plants.)
- 5) Fill the bottle three-quarters full with water obtained at the site.
- 6) Return the bottle to the classroom and place it on a window ledge (preferably a south-facing window) where sun will shine on it at some time in the day. Allow the contents to settle overnight.
- 7) If aquatic plants could not be obtained from the collection site, a visit to a local tropical fish store will be necessary. Purchase a few strands of an aquatic plant such as Canada Water Weed (Elodea). If you haven't obtained some snails in your original sample then it might be wise to purchase some of them as well. If you want fish in your ecosystem, three or four small guppies might be purchased. (Remember, the guppies will eat some of the other life.)
- 8) Carefully insert the aquatic plants into the bottle and secure them in the bottom sediment (if necessary by tying them to a weight such as a stone).
- 9) If guppies are added to the system, they should first be placed in a plastic bag. The bag and contents should be placed in the ecosystem so that the water temperature in the bag has a chance to gradually become the same as the water in the ecosystem. This is necessary or the fish might suffer from temperature shock and die. After several hours, release the fish from the bag into the larger container.
- 10) Place a lid on the bottle, but don't seal it.
- 11) After a few weeks, when the system is functioning and appears to be in some sort of balance, the bottle can be sealed by melting some paraffin wax and applying it around the lid or stopper so that no air can enter or leave.

IV OTHER THINGS TO CONSIDER

- 1) If time is not a factor, (and it shouldn't be) allow the system to adjust to the light source for several weeks before adding guppies.
- 2) If space and time is available, set up some experiments, using other bottles to illustrate various ecosystems. For example, you can add or subtract components of the system. More guppies can be added in a second bottle, or sediment might be excluded from a third bottle. Using the one ecosystem as a control, it is possible to see how each of the various components are important to the 'balance' that eventually is established.

- 3) If chemical testing equipment is available, and the ecosystem has not been sealed, it is possible to test on a weekly or even daily basis the chemical nature of the water. Oxygen, carbon dioxide and pH levels might be determined and graphed over an extended period to see what changes occur.

V QUESTIONS

- 1) After obtaining definitions for each of the following terms, explain how each applies, or is represented in, your miniature ecosystem, giving examples in each case.
 - a) biotic factors
 - b) abiotic factors
 - c) producers
 - d) niches
 - e) consumers
 - f) food chains
 - g) nutrients
 - h) herbivores
 - i) carnivores
- 2) Devise experiments to illustrate (using your mini-ecosystem);
 - a) the importance of sunlight
 - b) the possible consequences of organic pollution
 - c) chemical pollution
 - d) the effects of phosphates on algae
 - e) the importance of snails in an aquatic ecosystem
 - f) the effects of dairy waste on a natural pond ecosystem
 - g) the effect of eroded soil on a pond ecosystem.

VI BOOKS TO KEEP UP YOUR INTEREST

- 1) A Guide to the Study of Freshwater Ecology by W.A. Andrews et al., Prentice-Hall, 1972. This book contains basic information on aquatic ecology plus a good deal of information on carrying out field studies.
- 2) Man in the Web of Life by J.H. Storer, New American Library, 1968. A pocket-book that is general in nature and positions man within his environment.
- 3) Concepts of Ecology, by E.J. Kormondy, Prentice-Hall, 1969.
- 4) Ecology ed. by Peter Farb. Life Nature Library, Time Inc., 1963.
- 5) The Biosphere by Scientific American, Inc., September 1970 issue of Scientific American. The articles entitled The Biosphere and The Energy Cycle of the Biosphere should be extremely interesting and valuable to the secondary school science student.

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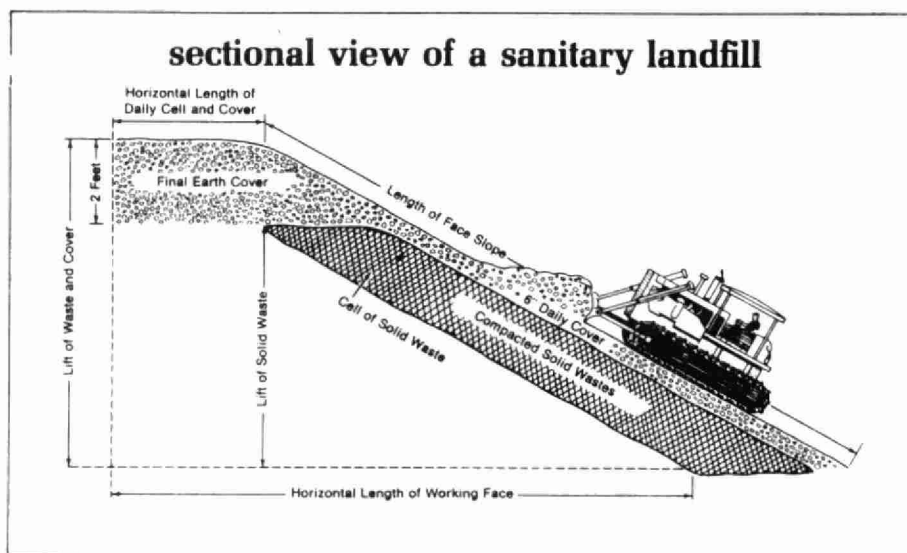
EDUCATIONAL FACT SHEET: A VISIT TO A LANDFILL SITE

(This fact sheet is designed to assist teachers and students interested in practical field studies involving waste management and its associated problems.)

Introduction: Landfill sites can offer students a valuable first-hand view of waste problems in our society.

It should be clear, however, that landfill sites, no matter how well maintained, are not the final answer to our waste problems. Landfill sites use up land which we need for building and agriculture. They also remove valuable natural resources from future use.

The real answer to a good waste management policy is the reduction of garbage at its source and the recycling and reuse of our natural resources. Ultimately, landfill should, and will be a disposal method for the residue left after material and energy resources have been extracted from garbage.



Source: Publication SW-77C, Guidelines for Local Governments
on Solid Waste Management, U.S. Environmental Protection Agency.

A Task: Besides taking photographs, recording the nature of the soil, the number and frequency of trucks that bring materials for disposal, etc., the student can carry out his/her own Landfill Site Rating. This rating method has been adapted from one used by The Illinois Pollution Control Board in accord with their Environmental Protection Act of 1970.

The rating method is an approach to "measuring the level of acceptability" of the various operations taking place at a given land disposal site and as such, can focus a student's thinking on the major concerns of a landfill site operation.

FIVE POINTS ARE GIVEN FOR EACH 'YES' RESPONSE TO THE 'ITEMS' IN THE ASSESSMENT. IF THE OPERATION RECEIVES 100 POINTS, THE RATING IS 100% OF WHAT SHOULD BE EXPECTED. IF THE SCORE IS LESS THAN 100, MODIFICATIONS AND IMPROVEMENT ARE INDICATED AND COULD BE BROUGHT TO THE ATTENTION OF THOSE RESPONSIBLE FOR THE SITE.

IF ANY OF THE 'ITEMS' DO NOT APPLY TO THE LANDFILL SITE BEING STUDIED, AUTOMATICALLY ALLOT THE 5 POINTS AS A 'YES' RESPONSE.

Other Activities for Students Studying Landfill Operations

1. Basic to any thorough study of waste management and landfill operations is a working knowledge of the vocabulary employed. Obtain definitions or descriptions for each of the following terms as applied to these operations:

- i) Inert fill
- ii) Open burning
- iii) Permeable
- iv) Putrescible
- v) Potable water
- vi) Scavenging
- vii) Vector
- viii) Leachate
- ix) Methane
- x) Hydrology
- xi) Groundwater
- xii) Cell
- xiii) Aquifer
- xiv) Anaerobic decomposition
- xv) Lift
- xvi) Rodent
- xvii) Pathogen

2. If during a visit to a landfill site, time is available to record the types of solid wastes entering the site, the accompanying chart might be useful in preparing a checklist of what is observed. (Observation will likely be from a distance.)

3. Make a plan view sketch of the landfill site noting the position of all major components of the operation, such as access roads, permanent and portable fences, buildings, trenches, compacted cells, open cells, etc., as well as general site characteristics, such as neighboring trees, ravines, water courses, roads, houses, etc. Include an approximated scale and a north directional arrow.

4. Take along a camera, but be sure to keep a record of each picture taken, including subject matter, and direction in which picture was taken.

5. Although landfill operations will give way to more sophisticated waste management as the Ministry of the Environment develops its 15-year resource recovery program, landfill sites can be used constructively to improve a local environment by reclaiming damaged lands for productive use. Explain how landfill could be used to actually improve on our living space.

6. To continue your study obtain the following publication at a cost of two dollars, Waste Disposal by Landfilling, available from the Ministry of Government Services, Publications Centre, 3rd Basement Level, MacDonald Block, Queen's Park, Toronto, M7A 1N8.

GENERAL CLASSIFICATION OF SOLID WASTES MATERIALS		
Garbage	Wastes from the preparation, cooking, and serving of food Market refuse, waste from the handling, storage, and sale of produce and meats	
Rubbish	Combustible (primarily organic)	Paper, cardboard, cartons Wood, boxes, excelsior Plastics Rags, cloth, bedding Leather, rubber Grass, leaves, yard trimmings
	Noncombustible (primarily inorganic)	Metals, tin cans, metal foils Dirt Stones, bricks, ceramics, crockery Glass, bottles Other mineral refuse
Ashes	Residue from fires used for cooking and for heating buildings, cinders	
Bulky wastes	Large auto parts, tires Stoves, refrigerators, other large appliances Furniture, large crates Trees, branches, palm fronds, stumps, flottage	
Street refuse	Street sweepings, dirt Leaves Catch basin dirt Contents of litter receptacles	
Dead animals	Small animals: cats, dogs, poultry, etc. Large animals: horses, cows, etc.	
Abandoned vehicles	Automobiles, trucks	
Construction & demolition wastes	Lumber, roofing, and sheathing scraps Rubble, broken concrete, plaster, etc. Conduit, pipe, wire, insulation, etc.	
Industrial refuse	Solid wastes resulting from industrial processes and manufacturing operations, such as food-processing wastes, boiler house cinders, wood, plastic, and metal scraps and shavings, etc.	
Special wastes	Hazardous wastes: pathological wastes, explosives, radioactive materials Security wastes: confidential documents, negotiable papers, etc.	
Animal and agricultural wastes	Manures, crop residues	
Sewage treatment residues	Coarse screenings, grit, septic tank sludge, dewatered sludge	
Adapted from <i>Refuse Collection Practice</i> , American Public Works Association, 1966		

The Things to Consider:

ITEM I OPEN BURNING IS PROHIBITED: No solid waste should be burned at the sanitary landfill.
REASON: Open burning of solid waste creates odours, air pollution and fire and safety hazards. Burnable materials may be salvaged, incorporated into the landfill, shredded, chipped, sawmilled or incinerated in a permitted controlled burning device (remote from the landfill). Open burning at a sanitary landfill site, for any reason, converts the operation to that of an open dump.
RATING: Burning of solid waste on the site is never permitted.

YES _____ NO _____

ITEM II SPREADING AND COMPACTING: Solid waste to be compacted, should be spread on a slope at a ratio of no greater than two horizontal to one vertical in uniform layers. Such layers should not exceed a depth of two feet.
REASON: Successful operation and maximum utilization of a sanitary landfill depends upon adequate compaction of the solid waste. If this is not done, settlement will be excessive and uneven, resulting in vector infestation and limited usefulness of the completed site.
 For the best compaction, the equipment should take three to five complete passes over all the waste while travelling up and down the slope.
RATING: Solid waste is properly spread and compacted on an adequate slope.

YES _____ NO _____

ITEM III DAILY COVER: A compacted layer of at least six inches of suitable material should be placed on all exposed refuse at the end of each day of operation.
REASON: Daily covering of the solid waste is necessary to prevent insect and rodent infestation, blowing litter, fire hazard and unsightly appearance. Fly emergence generally is prevented by six inches of compacted soil.
 Daily covering also divides the landfill into "cells" that will limit the spread of an underground fire, should one occur.
RATING: A uniform, compacted layer of a minimum of six inches of suitable cover material is emplaced on a daily basis.

YES _____ NO _____

ITEM IV INTERMEDIATE COVER: At the end of each day of operation, in all but the final lift of a sanitary landfill, a compacted layer of at least twelve inches of suitable material should be placed on all surfaces of the landfill where no additional refuse will be deposited within sixty days.
REASON: It has been demonstrated that under the influence of wind, rain, traffic, and differential settlement, a minimum of twelve inches of intermediate cover material is required to insure control of odours, vectors, blowing litter and to inhibit accidental fires.
RATING: Twelve inches of compacted intermediate cover materials is emplaced when called for.

YES _____ NO _____

ITEM V FINAL COVER: A compacted layer of not less than two feet of suitable material should be placed over the entire surface of each portion of the final lift, not later than 60 days following the placement of refuse in the final lift.
REASON: A two-foot minimum thickness of compacted final cover will prevent emergence of insects, minimize escape of odours, prevent rodent burrowing, support plant growth, provide sufficient thickness integrity to offset erosion and settlement. This final cover provides an adequate bearing surface for vehicles and will also provide for an aesthetically pleasing finished site.
RATING: Final cover is emplaced within sixty days following the placement of refuse in the final lift.

YES _____ NO _____

ITEM VI CONTAMINATION CONTROL: No person should cause or allow operation of a sanitary landfill so as to allow or threaten to allow the emission or discharge of any contaminants into the environment so as to cause or tend to cause either air or water pollution.
REASON: Circumstances of location, the nature of waste deposited, and erratic operational procedures may lead to pollution of underground aquifers or surface waters.
 Offensive and dangerous concentrations of gases may occur in the soil or above ground and result in environmental abuse.
RATING: Solid waste is emplaced in a manner that will not adversely affect the air or waters of the province.

YES _____ NO _____

ITEM VII BLOWING LITTER CONTROLLED: All litter shall be collected from the sanitary landfill site by the end of each working day and either placed in the fill and compacted and covered that day, or stored in a covered container until it can be incorporated into the fill.
REASON: The purpose of a sanitary landfill is to dispose of solid waste in a nuisance-free sanitary manner. If papers and other light materials are scattered and the area is not policed (on and off the site), fire hazards, nuisances and unsightliness result. Planned use of portable wind fences, earth berms and perimeter fencing as well as daily policing, can be effective in litter control.
RATING: Blowing litter is controlled, and the site and surrounding area routinely policed.

YES _____ NO _____

ITEM VIII SCAVENGING PROHIBITED - CONTROLLED SALVAGING ALLOWED: No person shall cause or allow any scavenging at a sanitary landfill site. All salvaging operations at a sanitary landfill should be continued to an area remote from the working face; should be conducted in a sanitary manner; should not interfere with or delay the landfilling operation and materials salvaged should be removed from the site daily, or be separated by type and properly stored so as to not create a nuisance, a vector harborage or an unsightly appearance.

REASON: Nothing can be tolerated that interferes with the prompt sanitary disposal of solid waste. Scavenging at the working face of the fill is dangerous, delays the filling and covering operations and creates unsanitary conditions. The unplanned, uncontrolled, accumulation of salvaged materials, at the landfill site can only result in an open dump situation. A remote, processing, separating and storage operation may be permitted if a salvage facility permit is obtained.

RATING: Scavenging is never allowed at the site.

YES _____ NO _____

ITEM IX

OPERATIONAL CONTINUITY: Sufficient equipment and personnel as well as adequate, all-weather, on-site roads shall be available at all times in order to assure continuous operation of the landfill.

REASON: The purpose of a sanitary landfill is the immediate disposal of solid waste, in a sanitary manner, resulting in the elimination of nuisances and producing an aesthetically acceptable operation. Prior arrangements for stand-by equipment, substitute personnel, and on-site all weather road maintenance will eliminate unnecessary delays in the disposal operation.

RATING: Provisions have been made to insure operational continuity at the site.

YES _____ NO _____

ITEM X

LIMITED ACCESS: Access to a sanitary landfill shall be controlled by fencing, gates or other measures and limited to those times when an attendant is on duty and only to those authorized to use the site for disposal of solid waste. "Other measures" should include posted signs which clearly indicate the purpose of the operation; the owner or operator; hours of operation; instructions for after hours delivery; materials accepted and/or excluded; fees charged and emergency telephone numbers.

REASON: If public use of a sanitary landfill is allowed when no attendant is on duty, scavenging, burning and indiscriminate dumping commonly occur.

RATING: Site access is controlled.

YES _____ NO _____

ITEM XI

EMPLOYEE FACILITIES: Adequate shelter, sanitary facilities and communications for employees shall be provided.

REASON: Shelter is a needed protection of the sanitary landfill employees during inclement weather. Toilet and handwashing facilities are required for good personal hygiene and communications are a must if an emergency occurs at the site.

RATING: A shelter of adequate size, containing safe drinking water, sanitary handwashing and toilet facilities, suitable heating facilities, screens, electricity, and communications is provided.

YES _____ NO _____

ITEM XII

FIRE PROTECTION: Adequate measures for fire protection are provided. These measures should assure that a deliverable supply of water under sufficient pressure is available at the working face; a stockpile of earth, located near the working face of the fill in order to smother the fire; and suitable fire extinguishers are located on all equipment and in all buildings.

RATING: Adequate fire protection is provided.

YES _____ NO _____

ITEM XIII

SPECIAL WASTES: No person shall cause or allow the deposit of burning material, hazardous and liquid wastes at a sanitary landfill site. When such material is accepted, it shall be handled in such a way and at such specific location as is delineated in special provisions of the permit.

REASON: Open burning is not allowed at the landfill site. The risk of a "hot" load starting a landfill fire is great if it is not extinguished quickly, and stored remote from the face of the fill and then incorporated into the landfill when it is certain that no fire hazard exists. Wastewater treatment sludges are hard to handle, potentially infectious and capable of creating health hazards or nuisances if not properly handled. Other materials, such as oil sludges, chemical wastes, magnesium shavings and insecticides or herbicides can present special hazards to both landfill employees and the environment.

RATING: Permitted procedures are established and followed for the disposal of special wastes.

YES _____ NO _____

ITEM XIV

VECTOR CONTROL: Adequate measures to control insects and rodents at the sanitary landfill are required.

REASON: Vectors are organisms that have the capability of transmitting pathogens to animals and man. With proper amounts of daily, intermediate and final compacted cover material emplaced, the need for routine application of rodenticides and insecticides will be greatly reduced or negated.

RATING: Vector control is not needed or is adequately provided.

YES _____ NO _____

ITEM XV

DUST CONTROL: Suitable control measures should be initiated whenever and wherever dust is a problem at the sanitary landfill.

REASON: Excessive dust at the sanitary landfill can cause a slowdown of operations, accidents, excessive equipment wear, eye irritation and other injury to landfill personnel.

RATING: Suitable dust control measures are actuated as needed.

YES _____ NO _____

ITEM XVI

ACCIDENT PREVENTION AND SAFETY: A sanitary landfill operation should provide for an operational safety program.

REASON: The utilization of heavy earth moving equipment; the random movement of collection trucks and the sometimes erratic maneuvers of privately owned vehicles combined with the infectious, explosive, or flammable items in the solid waste can combine to create an accident-injury atmosphere.

RATING: Employees are given periodic safety training; a completely stocked first-aid kit is available; and a man trained in first-aid procedures is available on site during the working hours.

YES _____ NO _____

ITEM XVII ANIMAL FEEDING: No person shall cause or allow the feeding of farm or domestic animals upon the site of a sanitary landfill or with refuse delivered to the landfill.

REASON: There is a statistical correlation between the practice of feeding raw garbage to hogs and the relatively high incidence of trichinae infection in humans in the United States. Trichinosis in humans is a disease caused by a round worm contracted when people eat raw or insufficiently cooked meat that is infected by the worm. Garbage-fed swine contract this disease at a rate much higher than swine fed conventionally.

RATING: No feeding of domestic or farm animals occurs at the sanitary landfill.

YES _____ NO _____

ITEM XVIII LEACHATE: The development or operation of a sanitary landfill should provide adequate measures to monitor and control leachate. Leachate, formed in the landfill, has the ability to pollute both ground water and surface water, unless operational activities are effected which preclude its doing so. Monitoring wells and surface water samples are examples of proper monitoring follow-up.

RATING: Measures are in effect to monitor and control leachate at the sanitary landfill.

YES _____ NO _____

ITEM XIX AESTHETICS: The development or operation of a sanitary landfill should make provisions for concealing the operation from public view. In Ontario, if a site is not adequately screened, landscaping is required, using trees, shrubs and/or berms.

REASON: Regardless of site location, public acceptance of the sanitary landfill will depend upon aesthetic consideration.

RATING: Provisions for concealing the sanitary landfill operation from public view have been effected.

YES _____ NO _____

ITEM XX DRAINAGE AND GRADING: The entire site should be routinely graded and provided with drainage facilities to minimize run-off erosion of earth cover, and to drain rain water falling on the surface of the sanitary landfill.

REASON: Run-off from above the fill and rainfall on the fill may leach into the fill and pollute ground or surface water with the leachate. The cover material may settle and erode and the resulting standing water may allow mosquito harborage and operational difficulties.

RATING: The sanitary landfill is properly graded, and insures proper drainage at all times.

YES _____ NO _____

Landfill Site Rating: Tally Sheet

Evaluator's Name: _____

Date: _____ Time: _____

Landfill Site: Name/Location: _____

Personnel Interviewed: _____

<u>Item</u>	<u>Score</u>	<u>Item</u>	<u>Score</u>
I	_____	XI	_____
II	_____	XII	_____
III	_____	XIII	_____
IV	_____	XIV	_____
V	_____	XV	_____
VI	_____	XVI	_____
VII	_____	XVII	_____
VIII	_____	XVIII	_____
IX	_____	XIX	_____
X	_____	X	_____

Total Score: _____

Modifications or Improvements Suggested:

Signature of Evaluator

Sketch Map of Landfill Site

FACTS

FOR ENVIRONMENTAL STUDIES



Ministry
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ENVIRONMENTAL EDUCATION STUDY PROJECT FOR HIGH SCHOOL STUDENTS:* AN EDUCATIONAL FACT SHEET

(This fact sheet was prepared as a tool to assist students or teachers interested in developing environmental education programs.)

I Introduction and Purpose

Teachers and students often ask: "What can we do to begin an environmental studies program with our existing resources?" This fact sheet is designed as a guide to the teacher, student, group, or club interested in identifying environmental problems at the community level and helping to find solutions to them.

A model environmental education program is one which helps the individual become (1) aware of the environment and its associated problems; (2) concerned, knowledgeable, and accurately informed about the problems; (3) knowledgeable and informed about the possible future consequences of the problems; (4) engaged in clarifying values and making decisions based on attitudes and beliefs; (5) involved in finding the solutions to environmental problems—alternatives, tradeoffs, compromises, and costs; and (6) committed to and involved in some type of constructive action which enhances environmental quality.

—Jonathan M. Wert, Ph.D.

II Developing the Independent Studies Program

Some schools now have independent studies programs where students receive academic credit for individual or group work outside the classroom.

If there is no established program, there are a few things a student can do to help get one started. Ask your teacher if a program can be established in which you receive academic credit for individual work. Other questions you might ask, all of which should be answered in the school system's guidelines for students enrolling in the independent studies program are: What guidelines or standards should you follow in designing the study and preparing the report? For example, should the report include an abstract, be written in the third person, typed, footnoted, documented with photographs, and include a bibliography? How many copies of the report must be turned in? How will your report be evaluated? Will you be required to give a presentation of your study? What are the policies for researching your problem, utilizing the library and community resources? The use of libraries and resource people from the many agencies and organizations concerned with specific problems will be part of your project.

*Adapted with permission from Dr. Jonathan Wert from the publication Environmental Education Study Projects for High School Students, 1974, Tennessee Valley Authority.

Before beginning your study, there are three items you should consider--

Complexity--Probably the most difficult thing for you will be identifying a problem and narrowing the study down in scope so all the constraints or drawbacks in completing it are known. You won't want to select a problem which is beyond your capabilities or for which there are inadequate resources--literature, supplies, or materials, etc. Doing so would only result in a frustrating experience and a waste of time.

Time--Prepare a schedule of the work you plan to do so it can be completed before the end of the term.

Cost--The project described in this paper will require very little money, if any. However, prepare a description of the equipment, supplies, material, etc., you will need an estimate of the costs before deciding definitely on any given problem. Check with your teacher about the cost.

III Environmental Problem Solving

Problems with resource utilization and the environment are numerous. This is not a new phenomenon. As human populations and demand upon world resources increase, so do the number of problems or concerns. There are no simple solutions to these problems. They are very complex and implementing solutions to one problem often results in the creation of a multitude of other problems.

For example, if you try to stop air pollution by closing down an industry, you must recognize what would happen as a result of the loss of products and jobs. It is very important that you study the relationships of one problem to another. Economic, social, and political implications should be considered when arriving at solutions. Let's consider economics. You might select the solution that goes farthest to solve the problem, but then find that funds are not available or that the cost is too great in relation to the benefits. In this case, you should consider priorities and alternate solutions.

Keep in mind that finding solutions to environmental problems begins with you--the individual. It will do very little good to point the finger at someone else until you have examined your own behavior and life style to determine how your own actions change the environment in desirable or undesirable ways.

The real result of this problem-solving approach is not the report you prepare, but the experience you gain by seeing for yourself what is involved in finding answers that recognize both environmental protection and other public needs. Already the widespread national environmental concern of a few years ago is being crowded out of the center of public attention by worries over inflation and unemployment. Many people begin to lose interest in environmental problems when they find that the answers are not simple.

Canada is going to be facing these kinds of decisions not just in the next few years but throughout your lifetime. How wisely those decisions are made will determine our country's future quality of life. And you can make a positive contribution in determining how well they are made if you are willing to be an actively involved citizen and to devote time for studying and understanding these sometimes complex problems and issues. You can speak out on these issues and be heard--if you demonstrate that you have done your homework, have faced the issues with an open mind, and know what you are talking about.

Preparation of reports is required for carrying out the project described below. In your search for data and information, be sure to contact personnel from the entities (1) causing the distinct problem, (2) opposing the problem, and (3) having a legal responsibility to deal with the problem.

IV A Sample Project

Identifying and Lessening an Environmental Problem in Your Community.

Discussion--On page four, you will find a questionnaire containing a listing of environmental concerns. There are three methods for you to consider in using the information.

Method No. 1--Based on your knowledge about a particular concern in your community, select the category and element, or elements which you would like to learn more about. If you select "solid waste disposal" which is under categories "Water Problems" and "Land Use", you will note that it is also related to other categories--eg., Population, Resource Depletion, Aesthetics, etc. Study the relationships between the categories and address as many facets of the situation as time permits. In this method, you individually are deciding the priority area of concern.

Method No. 2--This method is a little more time-consuming and will require funds for materials--paper, reproduction, etc. It involves using page four as a checklist and interviewing at least 50 people from different age groups and walks of life in your community to determine which concern is considered to be of highest priority. Their primary concern then becomes your problem for study. In addition to the personal interview, you could also telephone to obtain the information.

Method No. 3--This method will require more time than methods 1 and 2 and more cost for materials. It may be appropriate as a team project. It requires utilizing page four to prepare a questionnaire which can be mailed to 100 to 500 people from different walks of life in your community. A possible problem with this method is that you could receive a poor return of questionnaires. It might be desirable to follow up with a telephone call to each respondent a few days after the questionnaire has been mailed to help ensure its completion and return. As in method 2, people in the community help you select the most important problem for your study.

The design of the study and actual format of your report--abstract, statement of the problem, etc.--should be determined with your advisor. Some important questions you should consider answering in the report are:

1. What is the nature or scope of the problem? (Solid waste, energy, air pollution, transportation, etc.)
2. Why does the problem exist? (This could include such topics as: lack of understanding and concern, lack of a solution, etc.)
3. What is the existing status of the problem in your community, region, and nation? (For example, if you select solid waste disposal, what is the situation with littering, open dumps, sanitary landfills, recycling, etc?)
4. Who (individuals including yourself and/or agencies) has the responsibility for offsetting the problem, and what is being done about it? (Include information on legislation, enforcement, funding of remedial programs at the local level, monitoring pollution, etc.)
5. What is the significant impact of the problem on the environment including the effects on plant and animal populations? (Include a discussion on the amount and type of land lost, transportation problems caused, changes in air and water quality and in wildlife habitat, noise, etc.)
6. What are the possible solutions to the problem? (Consider alternative solutions, compromises or tradeoffs, and an estimated cost for each solution.)
7. What can be done to help solve or minimize the problem?
8. What will you do as an individual (or group) to help solve or minimize the problem? (REMEMBER--This is the constructive action part of your project and is, therefore, very important.)

What do you feel are the most urgent environmental concerns? (Please rank the major categories by number in order of priority. Do the same for each of the elements within the categories.)

*Difficulties in citing the many concerns on this form cause the writer to urge you to provide any additional examples you might think of.

Major Categories

- _____ Population Problems
- _____ Transportation Problems
- _____ Energy Problems
- _____ Resource Depletion
- _____ Natural Environment
- _____ Aesthetics
- _____ Materialism
- _____ Planning, Design, and Construction Problems
- _____ Economic-Social-Cultural Problems
- _____ Knowledge Gaps
- _____ Health Hazards
- _____ Water Problems
- _____ Land Use Problems
- _____ Air Problems
- _____ Others*

Elements Within Major Categories

Population Problems

- _____ Distribution
- _____ Growth rate
- _____ Rural out-migration
- _____ Drain on nonrenewable resources
- _____ Others*

Transportation Problems

- _____ Highway construction
- _____ Lack of adequate mass transit systems
- _____ Traffic congestion
- _____ Others*

Energy Problems

- _____ Fuel shortages
- _____ Lack in development of alternate energy resources
- _____ Lack of efficiency in use and production
- _____ Others*

Planning, Design, and Construction Problems

- _____ Aesthetically and functionally poor architectural design
- _____ Lack of comprehensive regional planning
- _____ Lack of environmental understanding and concern among planners, designers, and contractors
- _____ Lack of planning to prevent future environmental problems and to solve current problems
- _____ Inadequate and shoddy construction
- _____ Others*

Economic-Social-Cultural Problems

- _____ Apathy and lack of leadership in problem solving
- _____ Failure of society to meet human psychological needs
- _____ Harmful social and work environments
- _____ Lack of adequate housing
- _____ Lack of adequate job opportunities
- _____ Life styles which are detrimental to environmental quality
- _____ Loss of cultural identity and cultural shock
- _____ Poverty
- _____ Consumer problems (prices)
- _____ Others*

Knowledge Gaps

- _____ Lack of programs to find and promote solution.
- _____ Lack of solutions to environmental problems
- _____ Lack of understanding of environmental problems
- _____ Others*

Health Hazards

- _____ Air pollution
- _____ Pesticides, herbicides, and toxic metals
- _____ Food additives
- _____ Noise
- _____ Radiation
- _____ Water pollution
- _____ Others*

Water Problems

- _____ Contamination of ground and surface waters by chemicals, dyes, etc.
- _____ Flood control
- _____ Lack of water use plans
- _____ Limitation of fresh water supplies
- _____ Sedimentation
- _____ Thermal discharges
- _____ Soft waste disposal
- _____ Solid waste disposal
- _____ Agricultural runoff
- _____ Others*

Air Problems

Emissions:

- _____ Trash burning, furnaces in homes
- _____ Industrial and power plants
- _____ Automobiles, trucks, buses, airplanes, motorcycles
- _____ Others*

Land Use Problems

- _____ Erosion
- _____ Inadequate zoning and planning
- _____ Loss of parks, open space, wetlands, and natural areas
- _____ Siting of facilities, e.g., nuclear power plants, power transformers and lines, etc.
- _____ Loss of agricultural lands due to urbanization and inundation
- _____ Mining operations
- _____ Solid waste disposal
- _____ Visual blight (litter, billboards, etc.)
- _____ Lack of land ethic
- _____ Others*

Resource Depletion

- _____ Lack of recycling for nonrenewable resources
- _____ Improper management of renewable resources
- _____ Others*

Natural Environment

- _____ Endangered animal species
- _____ Endangered plant species
- _____ Loss of fishery and wildlife resources
- _____ Loss of natural habitat
- _____ Others*

Aesthetics

Distracting:

- _____ Sights
- _____ Sounds
- _____ Smells
- _____ Others*

Materialism

- _____ Excessive waste in packaging
- _____ Lack of durable, long-lasting goods
- _____ Status products
- _____ Consumerism (product knowledge)
- _____ Others*

FACTS

FOR ENVIRONMENTAL STUDIES



Ministry
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CAFETERIA CRISIS: AN EDUCATIONAL FACT SHEET

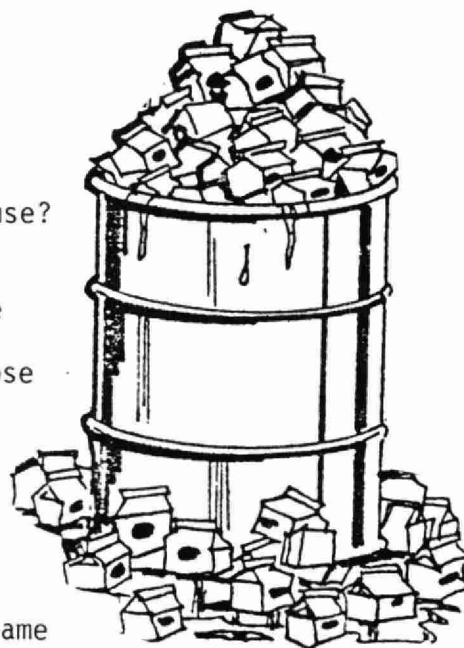
(This fact sheet was prepared as an educational tool and includes several suggestions for classroom activities.)

I Introduction

In this activity, students learn about their school cafeteria as it relates to the issues of solid waste. It is a late awareness activity which has many opportunities for expansion into the area of action. The basic activity, a tour of the cafeteria, talking with the personnel, working in it, or any combination of these, can be conducted in a class period. No equipment is needed, and grades two through 12 can be included.

II Questions

1. To lead into the activity, ask:
 - a. Do people in industrial roles think differently about wastes than we do?
 - b. How is the school cafeteria an industrial operation?
 - c. Is solid waste a problem?
2. To initiate the activity, ask:
 - a. What types of input are there into the kitchen daily?
 - b. How are these packaged differently from those we purchase for individual use?
 - c. How do the products change as they go through the cafeteria?
 - d. What kinds of waste are produced by the cafeteria?
 - e. What kinds of waste are produced by those who use the cafeteria?
 - f. Are all the wastes produced visible?
3. To continue the activity, ask:
 - a. How are these wastes categorized?
 - b. What happens to each category?
 - c. What is the status of composting?
 - d. Are your ideas about wastefulness the same as those of the people in the kitchen?



4. To expand the activity, ask:
 - a. What types of sanitary laws govern the operations of a commercial kitchen?
 - b. Do these conflict with "wastefulness"?
 - c. Can you suggest any remedial action to any undesirable situations?
 - d. How would these suggestions be received?
 - e. Do people see the cafeteria as a solid waste disposal problem?
 - f. Could we let people know what happens behind the scenes?
 - g. What other establishments in the community might have similar problems?
5. To evaluate the students' efforts, ask:
 - a. What information did they find?
 - b. How well did they perform their investigations?

III Equipment

Preliminary investigations will require no special equipment.

IV Procedure

The students will conduct a study of the school cafeteria and its role in solid waste problems. The construction of a flow chart may be encouraged.

V Past Studies

Among actions taken in various school cafeterias are:

1. Signs encouraging ecological habits--carrying lunchboxes instead of bags, using bread bags instead of new sandwich bags, discouraging food wasting, etc.
2. Kitchen managers can sometimes be persuaded to switch from disposable plastic to paper cups if they will not use reusable glasses.

VI Limitations

This activity is a fantastic learning experience. However, that does not imply that results will necessarily occur. Students must be led to understand legal and public health aspects of cafeterias, before they become discouraged over an inability to take constructive action.

(This fact sheet is adapted from an activity outlined in the publication Solid Wastes and Environmental Studies produced by the Institute of Environmental Education, 8911 Euclid Avenue, Cleveland, Ohio.)

FACTS

FOR ENVIRONMENTAL STUDIES



Ministry
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THE PRESENT TENSE OF SOAP: AN EDUCATIONAL FACT SHEET

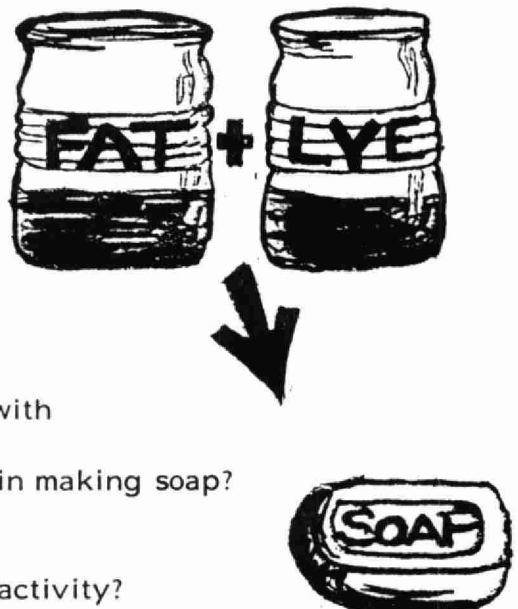
(This fact sheet was prepared as an educational tool and includes suggestions for classroom activities.)

I Introduction

In this activity, a common waste material will be used to produce a helpful product. The activity deals with the concept of recycling and points out that this is in no way a new concept. Because the activity involves the use of lye, students must be informed about the dangers of lye. Close supervision is necessary. The activity is most suitable for home economics in secondary schools. The activity requires two class periods, a week apart.

II Questions

1. To lead into the activity ask:
 - a. What do you do with left-over fats?
 - b. Are these waste or by-products?
 - c. What did the early Canadians do with fats?
2. To initiate the activity, ask:
 - a. What is soap?
 - b. Is a detergent soap? Explain.
3. To continue the activity, ask:
 - a. Is fat disposal a problem in this country?
 - b. How did our forefathers make soap?
4. To expand the activity, ask:
 - a. How is soap manufactured today?
 - b. How does home-made soap compare with manufactured soap?
 - c. Why is water purity a consideration in making soap?
5. To evaluate the students' efforts, ask:
 - a. How did the students respond to the activity?
 - b. To what degree did they apply the knowledge gained in performing the activity?
 - c. How well did the students work together?



III Equipment

1. Fats - a little over six lbs. or 13 cups
 - a. Kitchen grease
 - b. Tallow (beef, or sheep fat)
 - c. Lard (pork fat)
 - d. Poultry fats (should not be a major source)
 - e. Vegetable Oils (should not be a major source)
 - f. Candle stubs
2. Three enamel pots (do not use aluminum)
3. Cold water (rain water or distilled water is preferable)
4. Heat source (bunsen burner)
5. Wooden stirring stick
6. Two or three thicknesses of cheesecloth
7. Gloves or vaseline for the person working with lye
8. 13 oz. container of lye
9. Measuring cup or scale
10. Molds (cardboard or cigar boxes, pyrex cake pan or wooden mold)
11. Cutting tool made of a strong thin wire suspended between two sticks of wood
12. Vinegar...for safety purposes to neutralize lye.

IV Procedure

1. Collect fats.
2. Clarify fats by boiling one part fat to two parts water. Filter through two to three thicknesses of cheesecloth.
3. Place two and a half pints of cold water in the enamel pan. Gradually add 13 oz. of lye while stirring with a wooden stick. Let the liquid mixture cool to room temperature.
4. Heat six pounds or 13 cups of fat to the point where it is completely melted.
5. Gradually pour the lye solution into the fat while stirring constantly. This should be done over a 15-20 minute period.
6. Stir slowly for another half-hour or until the solution begins to thicken.
7. Fill the molds with the slurry.
8. Set the molds in a warm place, undisturbed for a week.
9. When the soap has hardened, cut or flake it.
10. Be sure to wash your hands when finished!

V Limitations

1. Not all age levels will be able to conduct the entire activity.
2. Lye must be handled carefully. Should anyone get any on his clothes, skin or in his eyes, neutralize it with diluted vinegar and then wash it with water.

(This fact sheet is adapted from an activity outlined in the publication A Curriculum Activities Guide to Solid Wastes and Environmental Studies produced by the Institute of Environmental Education, 8911 Euclid Avenue, Cleveland, Ohio.)